Six Sigma for Analyzing Market Preferences

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1981: Dr. Math. ETHZ
1982-89: Manager Software–Development
1990-95: Senior Consultant – Digital Equipment Corp.
1996-99: Sales Support Manager – Proposal Center
1999ff: Euro Project Office AG, Zürich
  => Akao Price 2001 for original contributions to QFD
  => Member of the Board of QFD Institute Germany – QFD Architect
  => SwiSMA: Software Metrics, Functional Sizing
2000ff: Six Sigma Black Belt for GMC Software AG
  => ISO 9001 Management System
  => CMMI for Software Development
  => QFD and New Lanchester Theory
Traditional Metrics

Input

Process

Output

Descriptions
Checklists
Templates

Resources

Methods
Tools
ICT–Support

Success with your projects
Structured Methods
Product Development
Project Office
Proposal Management
Process Metrics

Measure Effort
Assess Process
Audit Project
Counts Bugs
Track Plans
Track Issues
Process with KPIs for Statistical Control

Success with your projects
Structured Methods
Product Development
Project Office
Proposal Management
Process Metrics

Input Metrics
Output Metriken
Key Performance Indicator

Descriptions Checklists Templates

Methods Tools ICT–Support

Goal Profile for KPIs
Effective Profile for KPIs
Process with Measured Transfer Function

Success with your projects
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Process Metrics

Input
- Input Metrics
- Key Performance Indicator

Process
- Description
- Checklists
- Templates

Resources
- Measure Effort
- Assess Process
- Audit Project
- Track Plans
- Counts Bugs
- Track Issues

Output
- Output Metriken
- Effective Profile for KPIs

Goal Profile for KPIs

Methods
- Tools
- ICT–Support

Input Descriptions Checklists Templates ICT–Support
Success with your projects
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\( y_1 \): Predicted Response of the Process

\( y_2 \): Expected Response of the Process

The Response \( y \)

“Prediction” \( \mathcal{P} \)

“Transfer” \( \mathcal{T} \)

The Controls \( x \)

Use Case \( x_1 \)
Use Case \( x_2 \)
Use Case \( x_3 \)
Use Case \( x_4 \)
Use Case \( x_5 \)
Use Case \( x_6 \)
Use Case \( x_7 \)
Success with your projects

Structured Methods

Product Development

Project Office

Proposal Management

Process Metrics

... no additional approach?
## Expected Response for Transfer Function

<table>
<thead>
<tr>
<th>Response</th>
<th>Planned Contributions</th>
<th>Expected Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y_1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y_2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y_3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y_4$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Target Response $y$
Planned Response for Transfer Function

- **Success with your projects**
- **Structured Methods**
- **Product Development**
- **Project Office**
- **Proposal Management**
- **Process Metrics**

**Response**

- **y_1**
- **y_2**
- **y_3**
- **y_4**

**Planned Contributions**

- **x_1**
- **x_2**
- **x_3**
- **x_4**
- **x_5**

**Expected / Planned Response**

Use Cases

- **Solution Profile** $x$ found by weighting contributions

- **Planned Response** $T(x)$

- **Target Response** $y$

- **Gap!**

- **= strong relationship; many contributions with strong weight**
- **= medium relationship, some contributions with medium weight**
- **= weak relationship, few contributions with light weight**
 Achieved Response for Transfer Function $\mathcal{T}$

- $\mathcal{T}(x) = \text{strong relationship; many work items with strong weight}$
- $\mathcal{T}(x) = \text{medium relationship, some work items with medium weight}$
- $\mathcal{T}(x) = \text{weak relationship, few work items with light weight}$
- $\circ = \text{1 Work Item}$

Use Cases:
- $x_1$
- $x_2$
- $x_3$
- $x_4$
- $x_5$

Expected / Achieved Response:

- $y_1$
- $y_2$
- $y_3$
- $y_4$

Solution Profile $x$ found by measuring work items

Target Response $y$

Gap!
Success with your projects

Structured Methods

Product Development

Project Office

Proposal Management

Process Metrics

Customers

Different Views

Product Managers

Different Views

Product Managers

Different Views

Product Managers
Transfer Functions – Value Combinators

Use Case Solution \( (x) \rightarrow \) Customer’s Needs \( (y) \)

- \( y = T(x) \):
  - The Use Case Solution \( x \) yields the Customer’s Needs \( y = T(x) \) as a response
  - Whether Customer’s Needs are met is a function of Use Case Solution profile vector \( x \)

- \( T \) is defined by critical Use Cases
  - Expected Response for selected business drivers
  - Critical technical requirements control the response

- \( T^p \) is the associated prediction function
  - \( T^p \) predicts the solution \( x \) that yields \( y = T(x) \)
  - For matrices, \( T^p = T^T \), the prediction function is the transposed matrix
Transfer Functions – Preference Combinators

Market Preferences \( x \) → Market Share \( y \)

\[ y = \mathcal{T}(x): \]

- The Market Preferences \( x \) cause the observed Market Share \( y = \mathcal{T}(x) \) as a response
- What Market Share is gain is the system response to the actual Market Preference vector \( x \)

\( \mathcal{T} \) is defined by critical Preferences

- Expected Response for selected market segments
- Critical preferences in those segments control the response

\( \mathcal{T}^\rho \) is the associated prediction function

- \( \mathcal{T}^\rho \) predicts the preferences \( x \) that yield \( y = \mathcal{T}(x) \)
- For matrices, \( \mathcal{T}^\rho = \mathcal{T}^T \), the prediction function is the transposed matrix
Sample Transfer Function

- The *customer phone number inquiry help desk*
  - Measurable market share
  - *Observed Response Profile*

- Unknown Market Preference
  - What customer preferences controls the decision to select our, or someone else’s, service?
  - Using QFD for predicting the control’s profile, we get the
  - *Predicted Response Profile*
Adding Trust Factor – improves!

Market Preference
Transfer Function

<table>
<thead>
<tr>
<th>Market Share</th>
<th>Observed Profile</th>
<th>Market Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our Market Share (26%)</td>
<td>2.6</td>
<td>MP-1 2 3 4 5 5 4</td>
</tr>
<tr>
<td>Co-1 Competitor 1 (20%)</td>
<td>2.0</td>
<td>MP-2 3 9 1 2 5 6 2</td>
</tr>
<tr>
<td>Co-2 Competitor 2 (31%)</td>
<td>3.1</td>
<td>MP-3 9 7 9 5 8 5 3</td>
</tr>
<tr>
<td>Co-3 Competitor 3 (23%)</td>
<td>2.3</td>
<td>MP-4 3 1 9 6 9 1</td>
</tr>
</tbody>
</table>

Competitive Profile for Market Preference

0.2 Convergence Range
0.3 Convergence Limit

Convergence Gap

Pay for regional?
Removing Regional Links – deteriorates!

### Market Preference

#### Transfer Function

- **Observed Profile**
  - MP-1: Response Time
  - MP-5: Popular Campaign
  - MP-6: Campaign Channel Coverage
  - MP-T: Trust Factor

#### Market Preference

- **Prediction Profile**
  - 0.58

### Market Share

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<thead>
<tr>
<th></th>
<th>Market Share</th>
<th>MP-1</th>
<th>MP-5</th>
<th>MP-6</th>
<th>MP-T</th>
<th>Convergence Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our</td>
<td>26%</td>
<td>2.8</td>
<td>4</td>
<td>5</td>
<td>9</td>
<td>2.8</td>
</tr>
<tr>
<td>Co-1</td>
<td>20%</td>
<td>2.6</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>Co-2</td>
<td>31%</td>
<td>3.1</td>
<td>9</td>
<td>9</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Co-3</td>
<td>23%</td>
<td>2.3</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

### Competitive Profile for Market Preference

- 2.2 2.4 3.0 2.2

#### Convergence Range
0.2

#### Convergence Limit
0.3
### Technology Factor – Best Explanation!

#### Market Preference Transfer Function

<table>
<thead>
<tr>
<th>Observed Profile</th>
<th>Market Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Time</td>
<td>Popular Campaign</td>
</tr>
<tr>
<td>MP-1</td>
<td>2.6</td>
</tr>
<tr>
<td>MP-5</td>
<td>3</td>
</tr>
<tr>
<td>MP-6</td>
<td>3.1</td>
</tr>
<tr>
<td>MP-T</td>
<td>2.3</td>
</tr>
<tr>
<td>MP-N</td>
<td>2.0</td>
</tr>
</tbody>
</table>

#### Market Share

<table>
<thead>
<tr>
<th>Competitor</th>
<th>Market Share (%)</th>
<th>Our Market Share (26%)</th>
<th>Co-1 Competitor 1 (20%)</th>
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<tr>
<td>Our</td>
<td>2.6</td>
<td>2.6</td>
<td>2.0</td>
<td>2.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Co-1</td>
<td>3</td>
<td>3</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Co-2</td>
<td>9</td>
<td>9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Co-3</td>
<td>1</td>
<td>1</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
</tr>
</tbody>
</table>

#### Convergence

- **Convergence Gap**: 0.05
- **Convergence Range**: 0.2
- **Convergence Limit**: 0.3

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**Success with your projects**

- Structured Methods
- Product Development
- Project Office
- Proposal Management
- Process Metrics
Was the Expert Judgment right?

<table>
<thead>
<tr>
<th>Rate what is important for you</th>
<th>Who does best?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>We do best!</td>
</tr>
<tr>
<td>1. Response Time</td>
<td>✔</td>
</tr>
<tr>
<td>2. Information Availability</td>
<td>✘</td>
</tr>
<tr>
<td>3. Regional Offices</td>
<td>✘</td>
</tr>
<tr>
<td>4. Regional Dialects</td>
<td>✘</td>
</tr>
<tr>
<td>5. Popular Campaign</td>
<td>✔</td>
</tr>
<tr>
<td>6. Campaign Channel Coverage</td>
<td>✘</td>
</tr>
</tbody>
</table>
The Big Number Problem

<table>
<thead>
<tr>
<th>x’s that <strong>COULD BE</strong> significant</th>
<th>x’s that actually <strong>ARE</strong> significant</th>
<th>Distributions of significant x’s</th>
<th>Transfer functions between Y’s and significant x’s</th>
<th>Y’s that <strong>COULD BE</strong> important to the customers</th>
<th>Y’s that <strong>ARE important</strong> to the customers</th>
<th>Distributions of Y’s that <strong>ARE important</strong> to customers</th>
</tr>
</thead>
</table>

**FUNCTIONS**
### New Lanchester Theory

**Success with your projects**

- **Structured Methods**
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- **Project Office**
- **Proposal Management**
- **Process Metrics**

#### Strategy of the Weak
- Find where your competitors are most vulnerable
- Win local battles!

#### Strategy of the Strong
- Make sure no small competitor can beat you on particulars
- Block competition!

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**Market Preference**

**Transfer Function**

<table>
<thead>
<tr>
<th>Observed Profile</th>
<th>Market Share</th>
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</thead>
<tbody>
<tr>
<td>Response Time</td>
<td>4.0 1.2 1.0 1.0 2.0</td>
</tr>
<tr>
<td>Popular Campaign</td>
<td>1.5 1.5 2.4 0.7 1.5</td>
</tr>
<tr>
<td>Campaign Channel Coverage</td>
<td>0.05 0.05 0.05 0.05 0.05</td>
</tr>
<tr>
<td>Trust Factor</td>
<td>0.05 0.05 0.05 0.05 0.05</td>
</tr>
</tbody>
</table>

**Select Improvement Ratio**

- Our Adjusted Achievement Profile: 2.6 1.7 2.2 2.9 1.3
- Competition's Achievement Profile: 1.5 1.5 2.4 0.7 1.5

**Target Advantage**: 40%  

\[ E^2 = 1.97 \]

**Market Preferences**

- **Market Preferences: Orange**
- **Competitive Solution: Yellow**
- **New Target Solution: Green**

---

**Market Preferences: Orange**  
**Competitive Solution: Yellow**  
**New Target Solution: Green**
Success with your projects
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**Deming Value Chain for SW Development**

**Enablers**

- Voice of the Customer (VoC)
- Customer's Needs (CN)
- Use Cases (UC)
- Critical to Quality (CTQ)
- Capability Maturity (CMM)
- Functionality (FN)
- Test Stories (TS)
- Acceptance Test (CT)
- Application Test (AT)

**Decision**

- Customer's Needs (CN) → Use Cases (UC)
- Critical to Quality (CTQ) → Use Cases (UC)

**Realization**

- Use Cases (UC) → Functionality (FN)
- Test Stories (TS) → Functionality (FN)
- Application Test (AT) → Functionality (FN)
- Acceptance Test (CT) → Functionality (FN)

- Functionality (FN) → Acceptance Test (AT)
- Functionality (FN) → Application Test (AT)
- Functionality (FN) → Capability Maturity (CMM)

- Capability Maturity (CMM) → Critical to Quality (CTQ)

- Critical to Quality (CTQ) → Use Cases (UC)

- Use Cases (UC) → Customer's Needs (CN)

- Customer's Needs (CN) → Voice of the Customer (VoC)

#Opinion polls
#CMMI level
#FP
#Bugs
Deming Value Chain for Product Development

**Success with your projects**

Structured Methods

Product Development

Project Office

Proposal Management

Process Metrics

**Enablers**

- Market Trends (MT) → BO → MT
- Competitive Analysis (LT) → MP → LT
- Use Cases (UC) → BO
- Critical to Quality (CiQ) → BO
- Market Preferences (MP) → BO
- Use Cases (UC) → MP
- Functionality (FN) → UC
- Links into SW Project

**Decision**

- Market Trends (MT) → Opinion polls
- Competitive Analysis (LT) → Market Share
- Business Objectives (BO) → Market Preferences (MP)
- Critical to Quality (CiQ) → BO
- Capability Maturity (CMM) → CiQ

**Realization**

- Capability Maturity (CMM) → #CMMI level
- Functionality (FN) → #FP
- Links into SW Project
- 25